**Topics: Normal distribution, Functions of Random Variables**

1. The time required for servicing transmissions is normally distributed with *μ* = 45 minutes and *σ* = 8 minutes. The service manager plans to have work begin on the transmission of a customer’s car 10 minutes after the car is dropped off and the customer is told that the car will be ready within 1 hour from drop-off. What is the probability that the service manager cannot meet his commitment?
2. 0.3875
3. **0.2676**
4. 0.5
5. 0.6987

Ans: A

1. The current age (in years) of 400 clerical employees at an insurance claims processing center is normally distributed with mean *μ* = 38 and Standard deviation *σ* =6. For each statement below, please specify True/False. If false, briefly explain why.
2. More employees at the processing center are older than 44 than between 38 and 44.

Ans: mean = 38 , standard deviation = 6

38+6=44

**FALSE**

1. A training program for employees under the age of 30 at the center would be expected to attract about 36 employees.

Ans: z=0.0918

Number of employess =400

=0.0918\*400

=36

**TRUE**

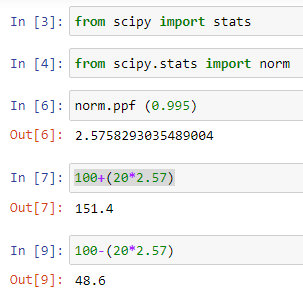
1. If *X1* ~ *N*(μ, σ2) and *X*2 ~ *N*(μ, σ2) are *iid* normal random variables, then what is the difference between 2 *X*1 and *X*1 + *X*2? Discuss both their distributions and parameters.

Ans: 2X1 = 2N(μ , 2 σ2)

X1 + x2 = *N*(μ, σ2) + *N*(μ, σ2)

= 2N (μ , σ2)

1. Let X ~ N(100, 202). Find two values, *a* and *b*, symmetric about the mean, such that the probability of the random variable taking a value between them is 0.99.
2. 90.5, 105.9
3. 80.2, 119.8
4. 22, 78
5. **48.5, 151.5**
6. 90.1, 109.9



1. Consider a company that has two different divisions. The annual profits from the two divisions are independent and have distributions Profit1 ~ N(5, 32) and Profit2 ~ N(7, 42) respectively. Both the profits are in $ Million. Answer the following questions about the total profit of the company in Rupees. Assume that $1 = Rs. 45
2. Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.

Ans:

mean profits from two different divisions of a company = (Mean1 + Mean2) \*45

= 540 Million

Variance of profits from two different divisions of a company =√(SD1^2 + SD2^2)\*45

= 5\*45

= 225 Million.

= **(90,990)**

1. Specify the 5th percentile of profit (in Rupees) for the company.

Ans: The formula below is used to compute percentiles of a normal distribution.

https://sphweb.bumc.bu.edu/otlt/mph-modules/bs/bs704_probability/ada-reference.gif https://sphweb.bumc.bu.edu/otlt/mph-modules/bs/bs704_probability/lessonimages/equation_image113.gif

from z table value for , 5 percentile = -1.645

X= 540+(-1.645)\*(225)

= 170

1. Which of the two divisions has a larger probability of making a loss in a given year?

Ans: both divisions are making loss.